



Global Product Certification
EMC-EMF Safety Approvals

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47 CFR Part 2.1091
Radiofrequency radiation exposure evaluation:
Mobile devices

Test Sample: Universal Monitoring Device (UMD)

Model Number: WG-V3-LTE-NA

Tested For: Cooltrax Asia Pacific Pty Ltd

Report Number: M180420_2

Date of Issue: 6 June 2018

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47 CFR Part 2.1091

Radiofrequency radiation exposure evaluation: Mobile devices

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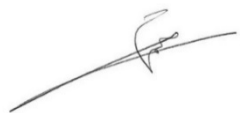
Test Sample: Universal Monitoring Device (UMD)
Model Number: WG-V3-LTE-NA
Manufacturer: Cooltrax Asia Pacific Pty Ltd


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KDB: **447498 D01 General RF Exposure Guidance v06**
RF exposure procedures and equipment authorization policies for mobile and portable devices.

Result: The WG-V3-LTE-NA complied with the RF exposure requirements of 47 CFR Part 2.1091, however an exclusion zone of 20 cm in front of the antenna applies, elsewhere the exposure level was below the mobile device limits.

Test Date: 30 May 2018

Test Officer: 
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EMR/EME Test Engineer

Checked by: 
Chris Zombolas
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EMC Technologies Pty Ltd

1 INTRODUCTION

This report is intended to demonstrate compliance of the WG-V3-LTE-NA Universal Monitoring Device (UMD) with the RF exposure requirements of 47 CFR Part 2.1091. Evaluation was performed in accordance with FCC KDB 447498 D01.

The test sample was provided by the Client. The conclusion herein is based on the information provided by the client.

2 GENERAL INFORMATION

(Information supplied by the Client)

The product is an automotive data logging unit that receives data from 433MHz wireless temperature and door tags and interfaces to the fridge in refrigerated trucks and containers and uploads this data over the cellular network. The unit can also be used in fixed installations for cold store monitoring. The product has a cellular module, GPS receiver and 433MHz transceiver.

2.1 EUT (ISM Transceiver) Details

Radio Module:	ISM Transceiver
Model Number:	Nordic NRF905
Operating Band:	433 MHz
Maximum Output power	10 dBm

Antenna:	Laser Antenna
Antenna Model:	405
Antenna Gain:	2.5 dBi

2.2 EUT (Cellular Transceiver) Details

Radio Module:	Cellular Module
Model Number:	u-blox TOBY-R202
Operating Band:	LTE band 2,4,5,12 and UMTS band 2,5
Maximum Output power:	+23 dBm for LTE and +24 dBm for UMTS

Antenna:	2J Antenna
Antenna Model:	2J6A4 1BG
Antenna Peak Gain	2dBi@900 MHz, 4 dBi@1900 MHz and 3.5 dBi @2500 MHz

3 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE), §1.1310

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

Where f = Frequency in MHz, * = Plane-wave power density

4 EVALUATION RESULT

The MPE was evaluated at 20 cm to show compliance with the power density listed in table 1,

The following formula was used to calculate the power density at 20 cm

$$S = \frac{P * G}{4\pi R^2}$$

$$S = \frac{EIRP}{4\pi R^2}$$

Where

(S): Power density (mW/cm^2)

(P): Output power at antenna terminal (mW)

(G): Gain (ratio)

(R): Minimum test separation distance (20 cm)

Technology	Frequency Band	Power	Gain	Duty Cycle	EIRP	EIRP	Flux Density at 20 cm	Flux Density limit	Percentage of the limit
		<i>dBm</i>	<i>dBi</i>	%	<i>dBm</i>	<i>mW</i>	<i>mW/cm²</i>	<i>mW/cm²</i>	%
UMTS	850	24	2	100%	26.00	398.11	0.0792	0.57	13.98%
	1900	24	4	100%	28.00	630.96	0.1256	1.00	12.56%
LTE	700	23	2	100%	25.00	316.23	0.0629	0.47	13.49%
	850	23	2	100%	25.00	316.23	0.0629	0.57	11.11%
	1700	23	4	100%	27.00	501.19	0.0998	1.00	9.98%
	1900	23	4	100%	27.00	501.19	0.0998	1.00	9.98%
ISM	433	10	2.5	100%	12.50	17.78	0.0035	0.29	1.23%
Worst case t Co-location consideration at 20 cm (UMTS 850 MHz and ISM)									14.71%

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Co-location consideration:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 .

$$\sum_{1}^N \frac{S_{eqN}}{S_{limN}} = \frac{S_{eq1}}{S_{lim1}} + \frac{S_{eq2}}{S_{lim2}} + \dots + \frac{S_{eqN}}{S_{limN}} \leq 1$$

Where: S_{eq} = Power Spectral density (mW/cm²) of a specific transmitter
 S_{lim} = MPE limit (mW/cm²)

The following simultaneous transmissions are possible:

Transmitter 1	Transmitter 2	MPE Ratio Sum	Result
Cellular Transceiver	ISM	0.15	Pass

5 CONCLUSION

The WG-V3-LTE-NA was evaluated on behalf of Cooltrax Asia Pacific Pty Ltd with the RF exposure requirements of 47 CFR Part 2.1091. An exclusion zone of 20 cm was required in front of the antennas, away from this area the electric field measured at 20 cm did not exceed the MPE limit.